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EXAMINER

LEE, EUGENE

| ART UNIT | PAPER NUMBER |
|----------|--------------|
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2815

DATE MAILED: 08/26/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/633,132

Applicant(s)

BASCERI, CEM

Examiner

Eugene Lee

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 12 June 2002.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 39,41-48,50-56 and 74-83 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 39,41-48,50-56 and 74-83 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 39, 41 thru 47 are rejected under 35 U.S.C. 103(a) as being unpatentable over Laibowitz et al. '216 in view of Azuma et al. '363. Laibowitz discloses (see, for example, FIG. 7) a DRAM capacitor comprising a substrate (material layer) 12, whereupon a mesa (a first level and a second level, sidewall region) 51 and high dielectric film (high dielectric constant thin film material) 56 are formed. Laibowitz does not disclose doping of said BST high dielectric thin film material being such that the stoichiometry of said BST high dielectric thin film material is substantially uniform at least at said sidewall region. However, Azuma discloses (see, for example, column 6, lines 35-45) that doping with additional A or B-site-type element in an ABO_3 dielectric, such as BST, of a DRAM capacitor will keep uniform the overall stoichiometric ratio and therefore minimize crystal defects. See, for example, column 4, lines 14-22. Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to dope A or B elements in the high dielectric film of Laibowitz so that a uniform stoichiometry is maintained and crystal defects are minimized.

- a. Regarding the limitation of "a BST film", see column 2, lines 55-* where Laibowitz discloses the use of barium titanate, strontium titanate and *its mixtures*.
- b. Regarding claim 44, Laibowitz in view of Azuma discloses the claimed

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invention except for a Ti percentage of about 50% to about 53.5% throughout said BST high dielectric film. However, it would have been obvious to one of ordinary skill in the art at the time of invention was made to dope with Ti until this range is met, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. In re Aller, 105 USPQ 233.

3. Claims 48, and 50 thru 56 are rejected under 35 U.S.C. 103(a) as being unpatentable over Laibowitz et al. '216 in view of Azuma et al. '363 as applied to claims 39, 41 thru 47 above, and further in view of Leung et al. '762. Laibowitz in view of Azuma does not have a capping layer. However, Leung discloses that a capping layer may be formed to encapsulate a capacitor structure. See, for example, column 2, lines 27-56. Leung teaches that adding a capping layer protects the capacitor from diffusion and contamination. Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to include a capping layer in the capacitor structure of Laibowitz in view Azuma so that the above-cited problems can be avoided.

4. Claims 74 thru 83 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hosotani et al. '859 in view of Azuma et al. '363. Hosotani discloses (see, for example FIG. 7B and column 12, lines 31-44) a capacitor comprising a substrate 31, first electrode 32, dielectric film 34, and second electrode 35. Hosotani does not disclose doping said dielectric film such that the stoichiometry of said film is substantially uniform at least at said sidewall region. However, Azuma discloses (see, for example, column 6, lines 35-45) that doping with additional A or B-site-type element in an ABO_3 dielectric of a DRAM capacitor will keep uniform the overall stoichiometric ratio and therefore minimize crystal defects. Therefore it would have been

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obvious to one of ordinary skill in the art at the time of invention to dope A or B elements in the high dielectric film of Hosotani so that a uniform stoichiometry is maintained and crystal defects are minimized.

Product-by-Process Limitations

5. While not objectionable, the Office reminds Applicant that “product by process” limitations in claims drawn to structure are directed to the product, per se, no matter how actually made. *In re Hirao*, 190 USPQ 15 at 17 (footnote 3). See also, *In re Brown*, 173 USPQ 685; *In re Luck*, 177 USPQ 523; *In re Fessmann*, 180 USPQ 324; *In re Avery*, 186 USPQ 161; *In re Wethheim*, 191 USPQ 90 (209 USPQ 554 does not deal with this issue); *In re Marosi et al.*, 218 USPQ 289; and particularly *In re Thorpe*, 227 USPQ 964, all of which make it clear that it is the patentability of the final product per se which must be determined in a “product by process” claim, and not the patentability of the process, and that an old or obvious product produced by a new method is not patentable as a product, whether claimed in “product by process” claims or *otherwise*. Note that applicant has the burden of proof in such cases, as the above case law makes clear. Thus, no patentable weight will be given to those process steps which do not add structural limitations to the final product.

The limitation “having a post deposition doping” merely recites a process of forming a semiconductor device and does not affect the final structure of a capacitor with a BST film of substantially uniform stoichiometry.

Since the applicant’s claims are directed towards device, only the limitations that determine the device’s final structure will be considered.

Response to Arguments

6. Applicant's arguments filed 6/12/02 have been fully considered but they are not persuasive. See **Product-by-Process Limitations** paragraph above.

Regarding the applicant's argument that Laibowitz in view of Azuma does not disclose the doping of the BST high dielectric thin film material such that the stoichiometry of said BST high dielectric thin film material is substantially uniform at least at said sidewall region, the Office respectfully disagrees due to the fact that Azuma clearly states a dielectric thin film be additionally doped in order to maintain the film's stoichiometry. This additional doping remains in the film and finalizes the film's uniform stoichiometry (1:3:1) within a semiconductor device. **Therefore, a film of a "substantially" uniform stoichiometry (1:3:1) must appear on the sidewalls of a capacitor (as evidenced by the film's chemical formula), unless the film changes into another chemical compound that is no longer 1:3:1, which, of course, is not the case.**

Also, the Merriam Webster Dictionary refers to uniform as "having always the same form, manner, or **degree**." Since the film is a BST film of a uniform stoichiometric ratio (1:3:1), it is a substantially uniform film. The film can not be a different film on the sidewall and then a different film in other areas; the film is a ABO_3 film having a substantially uniform stoichiometry of 1:3:1.

Even though gravity, for example, may shift the stoichiometry of the film on the sidewalls of a capacitor (as stated by the attorney on page 5, lines 14-17), it must be understood that the stoichiometry is still **substantially** uniform by virtue of the fact that the film remains 1:3:1. The Examiner understands "uniform" in this context to mean any film that has a constant

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stoichiometry (degree). Without question, the embodiment shown in Laibowitz in view of Azuma shows an ABO_3 film of **substantially** uniform stoichiometry.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

INFORMATION ON HOW TO CONTACT THE USPTO

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Eugene Lee whose telephone number is 703-305-5695. The examiner can normally be reached on M-F 8-5.


If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie C. Lee can be reached on 703-308-1690. The fax phone numbers for the

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organization where this application or proceeding is assigned are 703-308-7722 for regular communications and 703-308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

Eugene Lee
August 21, 2002



EDDIE LEE
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